Claims:

1. Neural cells obtained by exposing pluripotent stem or progenitor cells obtained from umbilical cord blood to an amount of a differentiation agent effective for changing the phenotype of said stem or progenitor cells to a neural phenotype.

2. The cells of claim 1 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT-SCF, interferon, triiodothyronine, thyroxine, erythropoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

3. The cells of claim 1 wherein said differentiation agent is a mixture of retinoic acid and NGF.

4. A method of producing neural cells from umbilical cord blood comprising:
   a. obtaining a sample of mononuclear cells from said umbilical cord blood; and
   b. growing said mononuclear cells from step a in a culture medium containing an effective amount of a differentiation agent for a period sufficient to change the phenotype of said stem or progenitor cells to neural.

5. The method according to claim 4 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT, interferon, triiodothyronine, thyroxine, erthyopoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

6. The method according to claim 4 wherein said differentiation agent is a mixture of retinoic acid and NGF.

7. The method according to claim 5 wherein said neuronal cells are selected from the group

consisting of mesencephalic cells and striatal cells.

8. A method of producing neural cells from umbilical cord blood comprising:
   a. obtaining a sample of mononuclear cells from said umbilical cord blood;
   b. selecting for and isolating a sample of pluripotent stem or progenitor cells within said sample; and
   c. growing said stem or progenitor cells from step b in a culture medium containing an effective amount of a differentiation agent for a period sufficient to change the phenotype of said stem or progenitor cells to neural.

9. The method according to claim 8 wherein said selecting and isolating step b is carried out using a magnetic cell separator to separate out cells containing a CD marker.

10. The method according to claim 8 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT, interferon, triiodothyronine, thyroxine, erthyopoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

11. A method of producing neural cells from umbilical cord blood comprising:
   a. obtaining a sample of mononuclear cells from said umbilical cord blood;
   b. growing said mononuclear cells from step b in a culture medium containing an effective amount of a differentiation agent for a period sufficient to change the phenotype of pluripotent stem or progenitor cells within said mononuclear cells to neural; and
   c. selecting for and isolating said neural cells from said sample of pluripotent stem or progenitor cells within said sample by essentially eliminating from said sample mononuclear cells having a CD marker.

12. The method according to claim 11 wherein said selecting and isolating step c is carried out using a magnetic cell separator to separate out cells containing a CD marker.

13. The method according to claim 11 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT, interferon, triiodothyronine, thyroxine, erthyopoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

14. The method according to claim 13 wherein said neuronal cells are selected from the group consisting of mesencephalic cells and striatal cells.

15. A method of producing a sample of enriched neural cells from a sample of mononuclear cells obtained from umbilical cord blood comprising:
    a. subjecting the mononuclear cells to an amount of an anti-proliferating cell agent effective to eliminate essentially all proliferating cells from said mononuclear cell sample;
    b. exposing the remaining non-proliferating cells from step a to a mitogen to provide a population of differentiated cells and quiescent cells comprising a population of pluripotent stem or progenitor cells;
    c. growing said population of said differentiated cells and quiescent cells from step b to selectively grow said quiescent cells to the essential exclusion of differentiated cells.

16. The method according to claim 15 comprising the further step of incubating a cell population obtained from step c to a differentiation agent effective to induce a neural phenotype in said pluripotent stem or progenitor cells.

17. The method according to claim 11 wherein said anti-proliferative cell agent is Ara-C.

18. The method according to claim 11 wherein said mitogen is selected from the group consisting of epidermal growth factor and pokeweed mitogen.

19. The method according to claim 12 wherein differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT, interferon, triiodothyronine, thyroxine, erthyopoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

20. The method according to claim 15 wherein said retinoic acid is selected from 9-cis retinoic acid, all transretinoic acid and mixtures, thereof.

21. The method according to claim 3 wherein said neural cells are used in allogeneic transplantation.

22. The method according to claim 5 wherein said neural cells are used in allogeneic transplantation.

23. The method according to claim 7 wherein said neural cells are used in allogeneic transplantation.

24. The method according to claim 9 wherein said neural cells are used in allogeneic transplantation.

25. The method according to claim 11 wherein said neural cells are used in allogeneic transplantation.

26. The method according to claim 15 wherein said neural cells are used in allogeneic transplantation.

27. A method of treating a damaged brain or spinal cord comprising transplanting into said brain or spinal cord an effective of number neural cells according to claim 1.

28. A method of treating a patient with a neurodegenerative disease comprising administering an effective number of neural cells according to claim 1 to said patient.

29. The method according to claim 24 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Alzheimer's disease, multiple sclerosis (MS), Tay Sach's disease, Rett Syndrome, lysosomal storage disease, ischemia, spinal cord damage, ataxia, alcoholism, amyotrophic lateral sclerosis, schizophrenia and autism.

30. A method of treating a patient with a neurodegenerative disease comprising transplanting an effective number of neural cells obtained according to the method of claim 3 to said patient.

31. The method according to claim 26 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Alzheimer's disease, Huntington's disease, amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), Tay Sach's disease,

Rett Syndrome, lysosomal storage disease, ischemia, spinal cord damage, traumatic brain injury, ataxia, alcoholism, amyotrophic lateral sclerosis, schizophrenia and autism.

32. A method of treating a patient with a neurodegenerative disease comprising administering an effective number of neural cells obtained according to the method of claim 5 to said patient.

33. The method according to claim 28 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Huntington's disease, Alzheimer's disease, amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), Tay Sach's disease, Rett Syndrome, lysosomal storage disease, ischemia, spinal cord damage, traumatic brain injury, ataxia, alcoholism, amyotrophic lateral sclerosis, schizophrenia and autism.

34. A method of treating a patient with a neurodegenerative disease comprising administering an effective number of neural cells obtained according to the method of claim 7 into said patient.

35. The method according to claim 30 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Huntington's disease, Alzheimer's disease, amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), Tay Sach's disease, Rett Syndrome, lysosomal storage disease, ischemia, spinal cord damage, traumatic brain injury, ataxia, alcoholism, amyotrophic lateral sclerosis, schizophrenia and autism.

36. A method of treating a patient with a neurodegenerative disease comprising administering an effective number of neural cells obtained according to the method of claim 9 into said patient.

37. The method according to claim 32 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Huntington's disease, Alzheimer's disease, amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), Tay Sach's disease, Rett Syndrome, lysosomal storage disease, ischemia, spinal cord damage, traumatic brain injury, ataxia, alcoholism, amyotrophic lateral sclerosis, schizophrenia and autism.

38. The method according to claim 33 wherein said ischemia is caused by a stroke or heart attack in said patient.

39. A method of treating a patient with a neurodegenerative disease comprising administering an effective number of neural cells in umbilical cord blood or a mononuclear cell fraction thereof to said patient.

40. The method according to claim 39 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Huntington's disease, Alzheimer's disease, amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), Tay Sach's disease, Rett Syndrome, lysosomal storage disease, ischemia, spinal cord damage, traumatic brain injury, ataxia, alcoholism, amyotrophic lateral sclerosis, schizophrenia and autism.

41. A method of treating a patient with a neurodegenerative disease other than amyotrophic lateral sclerosis comprising administering an effective number of neural cells to said patient.

42. The method according to claim 41 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Huntington's disease, Alzheimer's disease, amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), Tay Sach's disease (beta hexosaminidase deficiency), Rett Syndrome, lysosomal storage disease ischemia, spinal cord damage, traumatic brain injury, ataxia, alcoholism, schizophrenia and autism.

43. A composition comprising umbilical cord blood or a mononuclear cell fraction, thereof, in combination with an effective amount of at least one neural differentiation agent.

44. The composition according to claim 40 further comprising a cell medium to which said differentiation agent is added.

45. The composition according to claim 40 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature mesencephalic or striatal cells brain derived neurotrophic factor (BDNF), glial derived neurotrophic factor (GDNF),

glial growth factor (GFF) , nerve growth factor (NGF), fibroblast growth factor (FGF), transforming growth factors (TGF), ciliary neurotrophic factor (CNTF), bone-morphogenetic proteins (BMP), leukemia inhbitory factor (LIF), glial growth factor (GGF), tumor necrosis factors (TNF), interferon, insulin-like growth factors (IGF), colony stimulating factors (CSF), KIT receptor stem cell factor (KIT-SCF) , interferon, triiodothyronine, thyroxine, erythropoietin, thrombopoietin, glial-cell missing silencer factor, neuron restrictive silencer factor, SRC-homology-2-domain-containing transforming protein, neuroproteins, proteoglycans, glycoproteins and neural adhesion molecules.

46. The composition according to claim 40 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature mesencephalic or striatal cells, brain derived neurotrophic factor (BDNF), glial derived neurotrophic factor (GDNF), glial growth factor (GFF) , nerve growth factor (NGF) and mixtures, thereof.

47. The composition according to claim 40 wherein said differentiation agent is selected from the group consisting of mixtures of retinoic acid, brain derived neurotrophic factor (BDNF), glial derived neurotrophic factor (GDNF), glial growth factor (GFF) and nerve growth factor (NGF).

48. The composition according to claim 44 further comprising a cell medium to which said differentiation agent is added.

49. The composition according to claim 40 wherein said differentiation agent is a mixture of retinoic acid and nerve growth factor.

50. A method of producing a pharmaceutical composition comprising a sample of mononuclear cells being enriched with cells having a neural phenotype marker, said method comprising:

a. obtaining a sample of mononuclear cells from said umbilical cord blood; and

b. growing said mononuclear cells from step a in a culture medium containing an effective amount of a differentiation agent for a period sufficient to change the phenotype of said stem or progenitor cells to neural; and

c. combining said cells obtained from step b with a pharmaceutically acceptable carrier, additive or excipient.

51. The method according to claim 50 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT, interferon, triiodothyronine, thyroxine, erthyopoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

52. The method according to claim 50 wherein said differentiation agent is a mixture of retinoic acid and NGF.

53. The method according to claim 50 wherein said neuronal cells are selected from the group consisting of mesencephalic cells and striatal cells.

54. A method of producing a pharmaceutical composition comprising neural cells obtained from umbilical cord blood comprising:

a. obtaining a sample of mononuclear cells from said umbilical cord blood;

b. selecting for and isolating a sample of pluripotent stem or progenitor cells within said sample;

c. growing said stem or progenitor cells from step b in a culture medium containing an effective amount of a differentiation agent for a period sufficient to change the phenotype of said stem or progenitor cells to neural.; and

d. combining said cells obtained from step b with a pharmaceutically acceptable carrier, additive or excipient.

55. The method according to claim 54 wherein said selecting and isolating step b is carried out using a magnetic cell separator to separate out cells containing a CD marker.

56. The method according to claim 54 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT, interferon,

triiodothyronine, thyroxine, erthyopoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

57. A method of producing a pharmaceutical composition comprising neural cells obtained from umbilical cord blood comprising:
    a. obtaining a sample of mononuclear cells from said umbilical cord blood;
    b. growing said mononuclear cells from step b in a culture medium containing an effective amount of a differentiation agent for a period sufficient to change the phenotype of pluripotent stem or progenitor cells within said mononuclear cells to neural; and
    c. selecting for and isolating said neural cells from said sample of pluripotent stem or progenitor cells within said sample by essentially eliminating from said sample mononuclear cells having a CD marker; and
    d. combining said neural cells isolated from step c with a pharmaceutically acceptable carrier, additive or excipient.

58. The method according to claim 57 wherein said selecting and isolating step c is carried out using a magnetic cell separator to separate out cells containing a CD marker.

59. The method according to claim 57 wherein said differentiation agent is selected from the group consisting of retinoic acid, fetal or mature neuronal cells, BDNF, GDNF, NGF, FGF, TGF, CNTF, BMP, LIF, GGF, TNF, IGF, CSF, KIT, interferon, triiodothyronine, thyroxine, erythropoietin, thrombopoietin, silencers, SHC, neuroproteins, proteoglycans, glycoproteins, neural adhesion molecules, cell signalling molecules and mixtures, thereof.

60. The method according to claim 57 wherein said differentiation agent is a mixture of retinoic acid and nerve growth factor.

61. The method according to claim 57 wherein said neuronal cells are selected from the group consisting of mesencephalic cells and striatal cells.

62. A method of treating a patient for a neurodegenerative disease selected from the group consisting of multiple sclerosis (MS), Tay Sach's disease (beta hexosaminidase deficiency), Rett Syndrome, and lysosomal storage disease said method comprising administering to said patient an effective amount of human umbilical cord blood or a mononuclear cell fraction thereof to said patient.

63. The method according to claim 62 wherein said human umbilical cord blood or said mononuclear cell fraction thereof is administered via a parenteral route of administration.

64. A method of treating a patient in need thereof for a neurodegenerative disease other than amyotrophic lateral sclerosis, said method comprising administering an effective amount of human umbilical cord blood or a mononuclear cell fraction thereof to said patient.

65. The method according to claim 64 wherein said neurodegenerative disease is selected from the group consisting of Parkinson's disease, Huntington's disease, Alzheimer's disease, multiple sclerosis (MS), Tay Sach's disease, Rett Syndrome, lysosomal storage disease, ischemia, spinal cord damage, traumatic brain injury, ataxia, alcoholism, schizophrenia and autism.

66. A method of treating a patient in need thereof for a neurodegenerative disease comprising administering an effective amount of neural cells to said patient in the absence of a radiation step or chemotherapeutic step which is used to impair bone marrow production of hematopoietic cells.

67. The method according to claim 66 wherein neural cells are administered to said patient via a route of administration selected from the group consisting of intrathecal, intraventricular, intraparenchymal, intracisternal, intracranial, intrastriatal, and intranigral.

68. The method according to claim 67 wherein said neurodegenerative disorder is selected from the group consisting of Parkinson's disease, Huntington's disease, Alzheimer's disease, multiple sclerosis, Tay Sach's disease, Rett Syndrome, lysosomal storage disease, spinal cord damage, traumatic brain injury, ataxia, schizophrenia and autism.

69. A method of treating amyotrophic lateral sclerosis in a patient in need thereof, said method comprising administering an effective amount of human umbilical cord blood or a mononuclear cell fraction thereof to said patient in the absence of a radiation step or chemotherapeutic step which is used to impair bone marrow production of hematopoietic cells.